THE MASON WASP (*EUMENES CONICA*)

BY

MAJOR R. W. G. HINGSTON, I.M.S.

PART I

ARCHITECTURE

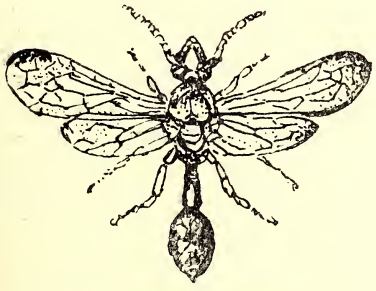
(With a plate and text figures)

This is the narrative of a mason wasp, the common species *Eumenes conica,* which I shall speak of as the cone-shaped *Eumenes.*

This wasp enjoys a wide distribution. It is found in all parts of the Indian Peninsula, crosses over into Ceylon, spreads east to the Burmese plains. From there it extends north to Chinese territory and south into the regions of Malay.

We are concerned with the female only. She is the architect. Her mate in comparison is puny and insignificant. He does no work. His business is to frolic in the tropical sun, to follow the mere dalliance of life. Certainly he performs the bare functions of his sex; but everything concerned with the architectural instinct, the skill, the industry, the intelligent toil, are the attributes of the female alone.

First a note on her appearance. Strong and powerful, a triangular head with incurved jaws, a square-shaped thorax, a thread-like waist, an abdomen swollen into an elongated pear: these are her most striking points. Dark-red in colour. On the front of her head is a patch of yellow, a few black bars cross her abdomen, a delicate purplish gloss tips her golden wings. She is smooth and clean and shining without a trace of any fur.



Eumenes conica

NOCTUID LARVA EXTRACTED FROM A MUD CELL OF *Eumenes conica*

In character bold and intrusive, she enters courageously into any apartment likely to supply her needs. Associated with this daring is some suspicion. If aware of any prying interference, she quickly deserts her home. Her habits are solitary in the

strictest sense. She is powerfully armed with sting and poison, not, however, supplied for protection, but in order to paralyze her prey.

I pass to architectural operations.

She constructs a cell composed of mud, building it in the shape of a dome. At the summit she leaves a circular aperture. This serves the purpose of a door. When the cell is built and the door still open she introduces an egg. Then she goes off to search for caterpillars. These she paralyses, then carries to the edifice, then pushes through the door. This is the provender necessary for her larva. She brings sufficient to fill the compartment, then closes the aperture with clay. The first cell is now complete; but no sooner has she finished one than she commences to build the next. Each cell is placed so as to touch an adjoining cell; consequently there results a cluster of neat little oval domes. She then covers the whole with mud until it looks like a shapeless cake. There are thus five architectural stages. First the raising of the dome, second the laying of the egg, third the introduction of the provender, fourth the closing of the gate. These four successive steps enter the construction of each separate cell. The fifth stage concerns the cell combination. It is the final cover which the wasp applies over the whole.

This is the briefest outline of her operations. I come now to some detailed points.

Work begins in the middle of April, at least in this district of Fyzabad. A preliminary investigation marks its commencement. Exploring verandahs, entering rooms, the wasp examines each shady corner in her efforts to find an acceptable site. Particular attention is given to woodwork. Every object receives minute inspection. Only after prolonged and careful investigation will she content herself with some special place.

She shows definite preference for a wooden foundation, and thus frequently selects the furniture of a room. I have seen her build on a flat table, on the vertical sides of wooden boxes, on the leg of an easy chair. Other materials are not neglected. One wasp chose an iron hat-box, a second the surface of a glass pane, a third a leather trunk. She seems quite indifferent to direction in space. The nest on the table lay in the horizontal, that on the glass in the perpendicular direction, the one on the hat-box had curved foundations to suit the convex base. More attention is given to conditions of light. If possible she avoids bright surroundings, usually choosing some secluded corner liberally supplied with shade. For this reason, I think, she avoids white plaster. Her dislike is for the glaring colour of the lime-wash, not because she thinks the foundations insecure.

The site, being chosen, is minutely examined. It must be prepared for the reception of mud. If an even surface, no attention is necessary; but if of a rough or fibrous texture, we observe that she tears away the shreds, diligently employing every effort to make the area smooth. This is but a preliminary act. Nevertheless it has an end in view. This surface will later become the floor of her cell. Within the chamber her grub will develop. Its body

will come in contact with the floor. Hence there must be no roughness or irregularity, nothing must be left that might injure the larva which is the object of all her toil.

Attend to her workmanship.

Here she comes. A vibrating hum denotes her arrival. In her jaws is a pellet of mud. First there is an aimless circle round the room; then, hesitating as though suspicious, she alights at the chosen spot. An antennary exploration is her next act. Apparently everything is satisfactory for she immediately proceeds to build. Carefully she lays her pellet on the site, then shapes it with her jaws into a low ridge about half an inch in length. On one side the ridge is vertical, on the other it shelves into a gentle slope towards what will later be the interior of the cell. This is the first stone in her edifice, a semi-liquid mud which very quickly dries into a solid brick. It takes her a minute to construct this ridge. When finished, she goes off. There is no delay. A second pellet is brought, applied to the first, spread out in the same manner so as to both lengthen and raise the ridge. More pellets follow. The ridge is extended, shaped into a curve, then bent round into an oval wall which becomes the substructure of the cell.

Architecture becomes now a systematic business. We watch her methodically coming and going. There is no haste, no hesitation. She works in an almost mechanical way. Often she flies direct to her edifice. At other times she alights a little distance away and from there goes on foot to her work. Watch her method. A position is taken on the wall. Her antennae are thrust into the oval where they investigate each step in the work. With hind and middle legs she holds the masonry, then begins to build. Her head is within, her abdomen curled round outside; she looks as if hanging to the edge of the wall. Her whole body is acutely bent; her wings, folded, erect and motionless, are kept well out of harm's way.

Now see the application of mud. With her fore tarsi she supports the pellet while her other legs grip the wall. Her mandibles knead out the mortar. They both spread it sideways into a layer and rake it up into an edge. Her antennae at the same time open and close, sensitive fingers measuring the ground and feeling the pellet being moulded into place. What a display of neatness and expedition! One or two minutes fixes the brick. A wait follows for perhaps a second, just a swift momentary survey. Then satisfied, she takes to her wings, disappearing with a noisy buzz.

She stays away a variable time. Her destination is the clayey patch where brick after brick is made. If the material is close at hand she is back in a minute; otherwise she may be absent more than twice that time. Occasionally she makes a prolonged interruption; I do not see her resume architecture until an hour has elapsed. The clay which she brings is of the finest material. It has been carefully selected and mixed with her saliva. Every particle of grit has been removed. Just sufficient moisture has been added to keep it in the spherical shape. Some species of

Eumenes insert pebbles in their masonry. The object of course is to strengthen the wall. But not so with the cone-shaped mason. She will have nothing but clay. Must she not have trouble in carrying this burden, a spherical globule of sticky mud about the size of an ordinary pea? Certainly if her jaws had not been specially adapted. But observe their suitability. They are long and curved and fit neatly round the pellet so as to enclose it in a ring.

I never caught her gathering clay. But her method must be the same as that of *E. dimidiatipennis,* an allied species that makes similar domes. From this latter I learn the necessary facts. These masons do not use ordinary mud; it is from the hardest and stoniest of available material that they make their architectural bricks. They seek it from the well-rolled thoroughfare, the solid road composed of limestone crushed and firmly driven in. There she fashions the viscid pellet, no doubt preferring powdery material because it can be made into more rigid clay. I see her alight on the open roadway. She digs into it, breaks it into dust, excavates a shallow depression into which she thrusts her head. In this hollow the globule is shaped. Her jaws gather up the finest dust; they thrust aside every granule except those of almost impalpable size. Her salivary glands pour out secretion. With this the dust is thoroughly impregnated until brought to the consistency of paste. Her jaws at the same time make it spherical; her antennae applied on either side examine and test its shape. A minute is sufficient for making the pellet. Then bringing forward her fore tarsi to support it, away she goes for the nest. Often she makes a circle or two around the area. This is a common habit of solitary wasps, a topographical performance, a visualization, a fixing of the spot in their memories with the intention of recognizing it again.

I return to the masonry. Pellet after pellet continues to arrive. For a quarter of an inch the wall is almost vertical. After this it begins to incline inward. The dome is coming into shape. She now builds so that each addition diminishes the oval. The wall curves in on every side. At length it appears to be complete except that it has a central hole. It is in fact a perforated dome.

Now follows an interesting performance. The central perforation is a true circle, in diameter one-quarter of an inch. Its edge is even. It is just a plain perforation in a cell.

This however will not suit the mason. She is not content with an ordinary hole. The time will come when she must plug this aperture. She must therefore have some special device in order to hold the stopper in place. For this purpose she constructs an everted rim all round the edge of the hole. Her last visit is devoted to this purpose. Again we observe her usual skill. Her tarsi hold her tightly to the turret as she lays this last pellet around the hole. She rotates upon the cupola, all the while drawing out her clay and smearing it along the edge. At the same time she neatly bends it outward so as to form an everted lip. What is the result? The opening is no longer a plain hole; rather it is shaped in the form of a funnel owing to the everted edge. What

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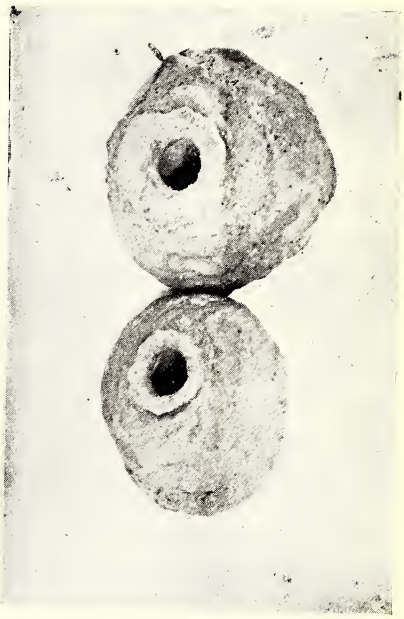

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THE MASON WASP

1. Completed nest of *Eumenes conica* with apertures of exit made by young wasps.
2. Cells of *Eumenes conica*.
3. *Eumenes* engaged at building her wall.
4. *Eumenes* introducing her eggs.

suitable preparation for a later stage! It will be an easy matter to close the cell by just thrusting a pellet into the funnel, certainly a simpler mechanical operation than securing a plain hole.

The cell is finished. An inspection follows, the wasp thrusting her antennae into the pot. She soon withdraws them, sits for a little while on the summit, but does not attempt to leave. Perhaps she is about to enjoy a rest. She deserves a respite after all this work.

But no. The next step comes quickly, a fascinating incident. Suddenly a deep absorption overcomes her. She seems as if struck into a trance. Slowly she creeps forward to the summit of her dome, advances so as to sit across it with legs spread out on either side. Gently her abdomen goes into the aperture; her legs clutch the everted rim. Her head bows, her antennae droop, her graceful wings fall down along her back; there she clings, rigid as a statue, half without and half within her cell. Why is she thus mesmerized? What absorbs her? There is only one meaning for such behaviour. She is fulfilling the purpose of her labour, introducing an egg into the dome. Not a motion, not a sound accompanies the act. Even the antennae, so seldom motionless, now fall into a passive state. If we look closely to the base of the abdomen we may note a faint convulsive thrill. This is the effort at egg-expulsion, her only indication of life. For one or two minutes she remains thus fixed, immersed in the glow of that supreme ecstacy which accompanies the fulfilment of these vital acts.

The egg is layed. We can tell from outside that the act is over. For restlessness returns after its expulsion. The antennae begin gently to quiver before she withdraws her abdomen from the cell. Sometimes her head now enters the aperture. Perhaps she is anxious to see her egg. It may not be properly attached. At other times, however, she shows no curiosity. Her abdomen is withdrawn. Away she goes without a trace of any desire to inspect this vital object of her toil.

She does not waste a moment. Provisions must be obtained quickly. Is not her egg exposed to danger owing to the open gate? Away she goes amongst the gardens and trees. Untiringly she pursues her deadly quest. Her motion is a swinging and hovering in the air with the utterance of a gentle hum. Now she sways from point to point, now she poises for a moment to pry into some likely nook, then she sweeps off to some more distant field or alights to pursue her search upon the ground. The period of absence will depend on her success. At length she returns. Suspended beneath her is a large caterpillar. It is almost as much as she can manage since it has to be carried through the air. How well she supports it! Her jaws fix it round the neck; her legs are wrapped about its body, they also gather up its tail so that nothing projects behind.

Her next business is to stuff it in the cell. She thrusts its head first through the gate, then, seizing it further back, pushes it in a little more. Eight or ten similar pushes follow until the whole caterpillar is inside. When the caterpillar's tail disappears, the wasp presses it down with her jaws. Then another inspection;